

LISTING OF THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Claims 1-7 (Canceled).

Claim 8 (Currently Amended) An ultrasonic vibration apparatus, comprising:
a disk like vibration plate having a circular vibration surface, said vibration surface having an outer periphery;
a support member coupled to said disk like vibration plate along a circular path located inside said outer periphery of said circular vibration surface so as to divide said vibration surface into inner and outer regions; and
a base member for the support member forming a chamber, the disk-like vibration plate closing off one end of the chamber, the chamber being open at an opposite end, and
a piezoelectric element coupled to a central region of said disk-like vibration plate inside the chamber to cause said inner and outer regions to vibrate in a resonance mode such that the inner and outer regions vibrate in substantially the same phase.

Claim 9 (Previously Presented) An ultrasonic vibration apparatus according to claim 8, wherein said circular path defines an amplitude vibration node of said vibration plate.

Claim 10 (Previously Presented) An ultrasonic vibration apparatus according to claim 9, wherein said support member has a hollow cylindrical shape.

Claim 11 (Previously Presented) An ultrasonic vibration apparatus according to claim 10, wherein said support member is coupled to a cylindrical base member having an outer periphery which lies outside of said circular path.

Claim 12 (Previously Presented) An ultrasonic vibration apparatus according to claim 11, wherein said cylindrical base member has a hollow cylindrical shape with a wall thickness that is greater than the wall thickness of said support member.

Claim 13 (Previously Presented) An ultrasonic vibration apparatus according to claim 11, wherein a groove is defined by said base member, said support member and said vibration plate and wherein a vibration damping member is located in said groove.

Claim 14 (Previously Presented) An ultrasonic vibration apparatus according to claim 13, wherein said vibration damping member is formed of a flexible material.

Claim 15 (Previously Presented) An ultrasonic vibration apparatus according to claim 13, wherein said vibration damping member is formed of a softer material than said vibration plate.

Claim 16 (Previously Presented) An ultrasonic vibration apparatus according to claim 11, wherein said vibration plate, said support member and said cylindrical base member are integral with one another.

Claim 17 (Previously Presented) An ultrasonic vibration apparatus according to claim 11, wherein said vibration plate, said support member and said cylindrical base member together define a cylindrical casing closed at one end by said vibration plate.

Claim 18 (Previously Presented) An ultrasonic vibration apparatus according to claim 8, wherein said vibration surface is a flat, planar surface and said inner and outer regions lie in the same plane.

Claim 19 (Previously Presented) An ultrasonic vibration apparatus according to claim 8, further including a groove located directly below said outer region and a vibration damping member located in said groove.

Claim 20 (Previously Presented) An ultrasonic vibration apparatus according to claim 19, wherein said vibration damping member is formed of a flexible material.

Claim 21 (Previously Presented) An ultrasonic vibration apparatus according to claim 19, wherein said vibration damping member is a material which is softer than the material of said disk like vibration plate.

Claim 22 (Currently Amended) An ultrasonic vibration apparatus, comprising:
a disk-like vibration plate having a circular vibration surface, said vibration surface having an outer periphery;
a support member coupled to said disk-like vibration plate along a circular path located inside said outer periphery of said circular vibration surface so as to divide said vibration surface into inner and outer regions; and
a piezoelectric element coupled to a central region of said disk-like vibration plate inside the chamber to cause said inner and outer regions to vibrate in a resonance mode such that the inner and outer regions vibrate in substantially the same phase;
further comprising a cylindrical base member on which the support member is disposed, the support member and base member being disposed on the same side of the vibration plate, the disk-like vibration plate closing off one end of the chamber, the chamber being open at an opposite end.

Claim 23 (Currently Amended) An ultrasonic vibration apparatus, comprising:
a disk-like vibration plate having a circular vibration surface, said vibration surface having an outer periphery;
a support member coupled to said disk-like vibration plate along a circular path located inside said outer periphery of said circular vibration surface so as to divide said vibration surface into inner and outer regions; and

a piezoelectric element coupled to a central region of said disk-like vibration plate to cause said inner and outer regions to vibrate in a resonance mode such that the inner and outer regions vibrate in substantially the same phase;

a base member for said support member;

further wherein the vibration plate is free from support in said outer region;

further wherein said disk-like vibration plate, support member and base member are of integral construction.